

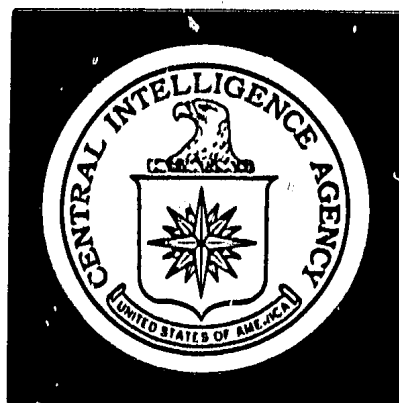
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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

The Symphonie Communications Satellite Program

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
December 1970

INTELLIGENCE MEMORANDUM

The Symphonie Communications Satellite Program

Introduction

The Symphonie project is a joint undertaking by France and West Germany (with minor participation by Belgium) to develop, build, and launch two communications satellites into equatorial synchronous (geostationary) orbit over the Atlantic Ocean. These satellites are being designed to permit extensive coverage of Europe, Africa, the Near East, and the Western Hemisphere.

This memorandum examines the background, current status, and prospects of the Symphonie program. It devotes special attention to an assessment of Franco-German objectives in undertaking the Symphonie project, especially as they relate to the International Telecommunications Satellite Consortium (Intelsat).

Background

1. The Symphonie program dates from June 1967 when the governments of France and West

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Germany agreed to merge their separate communications satellite (comsat) programs. The agreement called for equal cost sharing by the two countries and equal division of contracts between French and German industry. In October 1968, after reviewing bids submitted by two consortiums of French and German firms, the two governments chose the Consortium Industriel Franco-Allemand pour le Satellite Symphonie (CIFAS) to undertake the detailed planning and construction of the Symphonie satellites. France and West Germany made this decision to move ahead with their own comsat program notwithstanding the fact that they were both charter members of the International Telecommunications Satellite Consortium (Intelsat), created in 1964 and already in 1968 approaching its objective of deploying a "single global" comsat system.

2. CIFAS originally consisted of Nord Aviation, Sud Aviation, Compagnie Général de Télégraphie Sans Fil, Compagnie Française Thomson Houston Hotchkiss Brandt, Société Anonyme de Telecommunication from France and Messerschmitt Boelkow Bolhm and Junkers from West Germany. Subsequently, in order to give West Germany equal participation in the electronics portion of the program, the firms AEG Telefunken and Siemens and Halske were added to the winning consortium.

3. When other European countries were invited to participate in the Symphonie project, Belgium accepted and was given a 4% share in both the costs and the industrial participation.

System Characteristics

4. The Symphonie program provides for development and construction of a prototype satellite for ground testing, two satellites to be orbited, and two ground stations. The two flight-rated satellites are to be launched into synchronous equatorial orbits over the Atlantic at 15° West longitude. The first Symphonie satellite is now scheduled to be launched in mid-1973 and the second approximately six months later. The satellites will weigh about 400 pounds; each will have one receiving antenna (with a beamwidth capable of receiving signals from the one-third

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of the globe "visible" to the satellite) and two transmitting antennas. One of the transmitting antennas will cover Europe, the Middle East, and most of Africa with the centerline of the zone extending from the United Kingdom to Madagascar. The other transmitting antenna will cover northern South America, the Caribbean, and part of eastern North America with the centerline of the zone forming an axis approximately between Montreal and Buenos Aires.

5. Each Symphonie satellite will be able to relay two television channels or several hundred telephone channels.* They also will have a multiple access capability -- that is, they will be able to relay signals between more than two ground stations at the same time. (For a comparison between Symphonie and the Intelsat series of satellites, see the Appendix.)

Objectives Underlying Symphonie

6. The decision of France and West Germany to push ahead with Symphonie arose from a complex amalgam of technological, economic, political, and prestige considerations. Clearly, the desire to improve Europe's long-run position vis-a-vis the United States in the field of aerospace technology was a primary motive. The early success of the Intelsat system and the rapidly rising demand for its services indicated that satellite communications represented one area of aerospace technology where relatively early returns on investment could be expected. In addition to the hope for an economically viable Symphonie system, it is clear that France and West Germany counted on the building of a credible technological base to give them access to a substantially larger share of Intelsat procurement contracts.** Apart

* Information on the precise number of telephone channels is not available.

** There is evidence indicating that this hope has been realized to at least some degree. The non-US (principally West European) share in procurement for successive generations of Intelsat satellites is reported as follows: Intelsat I -- nothing; Intelsat II -- 3%; Intelsat III -- 6%; Intelsat IV -- 28% to 37% depending on incentive payments.

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from considerations of technological advance and economic gain, the Symphonie program almost certainly was viewed -- especially by France -- as an instrument designed to enhance European political leverage and prestige in dealing with the two superpowers and with the less developed countries on issues involving international space communications.

Symphonie and Intelsat

7. No Symphonie satellite has yet been orbited (for reasons discussed below), but the existence of the Symphonie program and the question of its intended role in international communications has posed problems for those concerned with maintaining the integrity of the Intelsat organization.

8. A basic initial concept underlying the formation of Intelsat was that it should become a single, global system, providing satellite communications to all regions of the world. Those favoring the "single global" principle (including the United States) were opposed to the establishment of regional comsat systems in competition with Intelsat for economic and technical reasons. The economic objection was grounded in a concern that regional systems would siphon off traffic from Intelsat, thus undermining its economic viability. This was considered a critical point since the agreements underlying Intelsat require it to be economically self-sustaining while a regional system could be subsidized by its sponsoring governments -- as is the case with Symphonie. Technical opposition to formation of independent regional systems originally stemmed from the fear that they would create harmful radio interference that would degrade the performance of Intelsat satellites. Subsequent technical experience has shown that mutual radio interference between systems probably can be avoided, but concern over Symphonie as a potentially damaging economic competitor to Intelsat has continued.

9. Initially, the French and West German governments labeled Symphonie as a purely experimental project and sought to establish that, on

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these grounds, it was eligible for technical assistance from the United States. Within a few months, however, the project's sponsors (with France taking the leading role) revealed unofficially (a) that Symphonie was in fact viewed as the initial phase of an operational system and (b) that they intended to press for the acceptance of regional systems within any permanent charter established for Intelsat.* In early 1968 an official of the French Ministry of Science indicated that, following successful testing, Symphonie would be used on an operational basis. This same official noted in late 1968 that this idea had been abandoned, but suggested that a follow-on operational comsat project might be undertaken after Symphonie. In a slightly different context, another senior French communications official declared that France's interest in Symphonie was predicated on the possibility of building a follow-on system. By 1969, France was sounding out US reaction to a plan envisaging the use of Symphonie to channel relatively low-density traffic from African countries into the Intelsat system, to function as a relay for traffic between African countries, and to distribute television programs to Africa.

10. Concurrently, at the negotiations on definitive Intelsat arrangements, France became a leading voice among those who insisted that the permanent Charter permit establishment of regional systems. Following lengthy debate and protracted negotiations, general agreement now has been reached among the Intelsat membership that regional systems will be permissible as long as they are technically compatible with Intelsat and will not inflict significant economic harm on the global system.

11. Still to be resolved in a practical context, however, are the knotty questions of what constitutes "significant economic harm" and of defining the characteristics of a "region." With

* Since its inception in 1964, Intelsat has operated under interim arrangements. Negotiations for a permanent charter have been under way since 1969 and may be completed in the spring of 1971.

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Symphonie and its possible successors in mind, France has taken the position that regional satellite systems should be permitted to embrace countries that share not only geographical contiguity and close economic ties (for example, Western Europe) but also those sharing historical and language ties (for example, France and Francophone Africa).

Status of Symphonie

12. The Symphonie project has provided France and West Germany with a revealing introduction into the complexities and costs of attempting to compete in the field of comsat technology. At the time of the Franco-German agreement on Symphonie in mid-1967, launching of the first satellite was set for late 1969. Since then the schedule has been pushed back several times, and the initial launch date is now set for mid-1973.

the cost of the Symphonie project has already ballooned from the \$40 million originally programmed in 1967 to almost \$130 million in 1970, with additional outlays almost certain to be required.

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13. The French and West German governments encountered substantial difficulty in advancing the Symphonie project from the concept phase to actual construction. From the signing of the joint agreement to build Symphonie in June 1967, 16 months elapsed before a prime contractor (the CIFAS consortium) was selected. Preparation and submission of the detailed design for Symphonie required about another year, and initial construction work on most satellite subsystems did not begin until early 1970. An important delaying factor in building the satellites has been the requirement for equal division of contracts between French and German industry which, on several occasions, has necessitated the rejuggling of assignments to maintain the stipulated balance. This requirement also has further complicated the problems of interface and coordination of an already complex project.

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14. Apart from administrative red tape, the Symphonie project has also run into some potentially serious technical problems. The builders of Symphonie have been instructed that the size and weight of the satellite must be suitable for launching by the Europa II booster, currently under development by the European Launcher Development Organization (ELDO), and designed to put a maximum of 400 pounds of payload into synchronous equatorial orbit. Because of the size constraints placed upon them, the Symphonie designers have had to reduce the number of transmitting antennas to be carried by the satellite from three to two. France and West Germany failed to procure several important types of satellite subsystems from US aerospace manufacturers in the spring of 1970. There is little doubt that the French and West Germans are capable of developing these subsystems themselves, but to do so will probably lead to further delays, additional technical problems, and may require additional modifications to the satellite.

15. Planning for Symphonie is proceeding on the assumption that Europa II -- the all-European launch vehicle being built by ELDO -- will be operationally available when the satellites are ready for launch.* Although the Europa I tests have failed to orbit a payload, ELDO has nevertheless declared all three stages qualified. Testing of Europa II -- the Symphonie launch vehicle -- is now scheduled to start in the spring of 1971 at Kourou, the launching base built by France in French Guiana. Given the possibility that new technical problems will arise during the testing at Kourou, Europa II may not reach operational status by the end of 1971 as planned. Even so, the Europa developers would still have about another 18 months to perfect the launch system before Symphonie is scheduled for its maiden flight.

* The basic launcher (Europa I) consists of a UK-built first stage (Blue Streak), a French-built second stage (Coralie), and a German-built third stage (Astris). Because of the added precision required to inject Symphonie into geostationary orbit, the Europa II version will also be fitted with an apogee-perigee system. Development testing of the first three stages of Europa I has been carried out at Australia's Woomera test range.

- 7 -

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16. France is the driving force behind the Symphonie satellite and appears to be determined to press ahead with the program despite substantial cost overruns, technical obstacles, and management problems. The first Symphonie satellite is now scheduled for launching into geostationary orbit over the Atlantic Ocean in mid-1973. Although design problems involving both the satellite and its launch vehicle remain to be resolved, this launch date probably can be met. The Symphonie satellite is being designed to handle two television channels or, alternatively, several hundred telephone channels and will have a multiple-station access capability. Symphonie's antennas will permit coverage of Europe, the Near East, most of Africa, the Caribbean area, northern South America, and part of eastern North America.

17. The heavy commitment of money, resources, and time to the Symphonie project by the French and West Germans reflects two related objectives. One is the aim of achieving for Europe a substantially improved position vis-a-vis the United States in the expanding field of aerospace manufacturing technology. Second, deployment of an operational Symphonie system is viewed by its sponsors -- especially France -- as a means of insuring that Europe is not relegated to a minor role within the emerging Intelsat global satellite communications network.

18. Under mounting pressure from Symphonie's backers -- along with certain other West European countries and Japan -- the Intelsat membership has now accepted the general principle that regional systems are permissible if they are technically compatible with Intelsat and will not cause significant economic harm to the global system. France's ambitious plans for Symphonie are likely to lead to considerable debate within the Consortium on the questions of what constitutes "significant economic harm" to Intelsat and what are the appropriate geographical limits of a "regional" communications satellite system.

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APPENDIX

Comparison of Symphonie and Intelsat Communications Satellites

	Symphonie	Intelsat			
		I	II	III	IV
Channel capacity					
Telephone only	Several hundred channels <u>a/</u>	240	240	1,200	9,000
Television only	2	1	1	4	12
Multiple access capacity	Yes	No	Yes	Yes	Yes
Weight (pounds)	400	85	191	279	1,225
Design lifetime (years)	5	1.5	3	5	7
Frequencies (GHz)					
Uplink	6	6	6	6	6
Downlink	4	4	4	4	4
Number of repeaters	2	2	1	2	12
Bandwidth per repeater (MHz)	90	25	130	225	35-40
Effective radiated power per repeater (watts)	830	10	35	150	200-4,600 <u>b/</u>
Total effective radiated power (watts)	1,660	20	35	300	2,400-25,200 <u>b/</u>
Stabilization method	Flywheel and gas jet system	Despun antenna	Despun antenna	Despun antenna	Despun antenna
First launch	Mid-1973	6 April 1965	25 October 1966	18 September 1968	December 1970 or early 1971

a. Exact telephone channel capacity of Symphonie is not known, but is believed to be somewhat greater than that of Intelsat II.

b. Depending on antenna beamwidths.